A Proposed Nomenclature for Star Colours. By W. S. Franks.

It is generally admitted that the nomenclature of star colours is at present in a very unsatisfactory state, and not at all in keeping with the exact methods employed in other departments of astronomical observation. The hitherto popular fashion of naming star tints after fruit, flowers, precious stones, &c., is both vague and arbitrary, and also objectionable on account of the frequent diversity in tint of the object referred to. Any standard whatever, to be of real utility, must be readily accessible and also of uniform tint—the same at all times and in all places. It is very evident that the terrestrial objects just mentioned do not fulfil any one of these conditions; and so they should now be definitely rejected, as their retention only serves to perpetuate the existing confusion. The late Admiral Smyth, who was doubtless responsible for the introduction of many of these poetic but exceedingly vague terms, felt the force of the objections to their use, when he wrote the brochure entitled "Sidereal Chromatics"—a book which was unfortunately only intended for private circulation, and therefore not so well known as it deserves to be. It contained a plate of coloured discs, with four gradations each of red, orange, yellow, green, blue, and purple, which was intended as a scale upon which star colours could be more definitely expressed. But this chromatic diagram, pretty as it looked, had several serious faults. Its twenty-four tints were not so carefully selected as they might have been, nor, indeed, were they sufficient to meet the requirements of the observer; and further, an opaque wafer of colour, necessarily viewed by artificial light (which of course modified its appearance), could not well be compared with a glittering stellar point. The successive depths of tint, also, were inversely put with regard to the numerical order. Thus, the deepest tint of red was called "Red ^{1}," and the palest "Red.^{4}" Some of the colours themselves are open to criticism. For instance, the two deeper shades of orange are not pure, but have a perceptible tinge of red, whilst the two corresponding shades of yellow are really orange-yellow. Neither the red nor the green are typical colours, as anyone may see by comparing them with the ordinary daylight spectrum; the former is too crimson, and the latter too bluish-green. There is some reference to the colours of stars in Professor Piazzi Smyth's "Madeira Spectroscopic," and a chromo-lithograph at the end of that work gives a graduated series of primary, secondary, and tertiary spectrum colours, with their corresponding wave-numbers.

It is pretty evident that, in the future, we must look to the spectrum for our standard colours. But as these star observations are confined to the period when the sun is below the horizon, it is equally obvious that they cannot be directly so

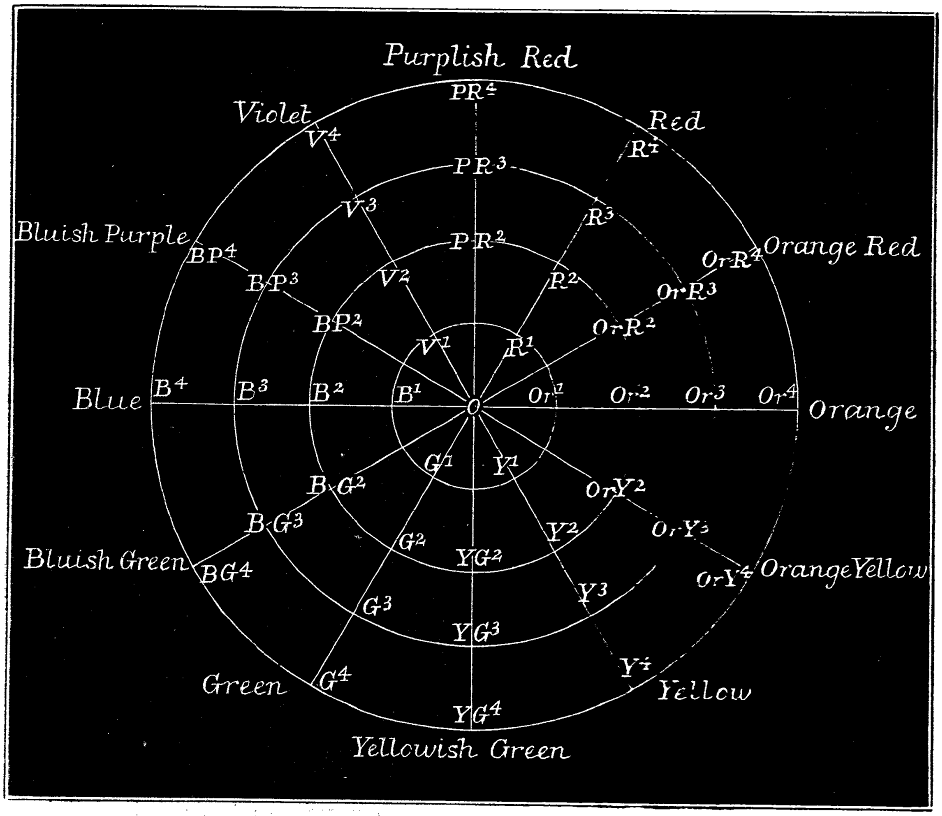
compared. This difficulty might be, however, got over by having a series of coloured gelatine discs carefully matched with the spectrum, and then viewing them as transparencies by the light transmitted from an incandescent electric lamp. In attempting to devise any plan for the more systematic observation of star colours, there are several essential points to be considered. The standard must be uniform, and easily accessible anywhere for reference, if it is to meet with universal adoption. The solar spectrum answers this end completely, since it affords a well-marked range of colours, which can be expressed in wave-lengths, or referred to certain Fraunhofer lines. The nomenclature should be as simple as possible, yet copious enough for ordinary requirements, and be arranged on some methodical plan, so as to be easily remembered. Its terms should have a precise and definite meaning, and be capable of numerical reduction, so as to get mean results from a number of observations. How far these conditions are fulfilled in the scheme which I have the honour to lay before the Society may be best judged of by reference to the annexed diagram. The germ of the present plan is due to certain suggestions made by Professor Pickering, that I should reject all modifications of white, as applied to stars, except in the direction of the prismatic colours, and that I should take white as one end of a series for each colour, giving a numerical ratio to each term in the series. It then occurred to me to call white the zero, from which the spectral colours radiate as a centre, each concentric ring corresponding to a given depth of each colour. Starting with red, the primary and subordinate colours are placed at equal distances round the circle up to violet, and the opposite ends of the spectrum connected by the intermediate tint of purplish red. On this plan, too, each colour is opposite to its complementary; the sum of any two opposite colours forming white light. This may be convenient in estimating the colours of "double" stars. As to the fiducial points to which the chief colours are referred I would, provisionally, adopt Professor Smyth's definition of them. They would then run as follows:—

Red	* WN 36,000:	Nearest Solar	lines	a and B.
Orange	,, 40,000:	,,	,,	α (alpha).
Yellow	,, 43,000:	,,	,,	D^1 and D^2.
Green	,, 49,000:	,,	,,	b^1, b^2, &c.
Blue	,, 56,000:	,,	,,	d.
Violet	,, 60,000:	,,	,,	G and g.

With regard to the *names* of the colours, I have tried to avoid even such terms as "citron," "glaucous," &c., because, though used by Professor Smyth, they would certainly be misinterpreted by many observers. In adopting Professor Picker-

* The wave-number is for the *centre* of each colour.

ing's restriction of "white," I have sacrificed all such qualifying adjectives as very, intense, pale, greyish, &c., for, as generally used, these refer to the relative *brightness* of the light rather than to its colour. The terms I have proposed for the subordinate tints carry their own meaning, as they are compounded of the two adjacent primaries. And, by inverting the order, a minuter subdivision might be made, exactly analogous to the case of star magnitudes; as we could divide the interval between green and blue, say, into "bluish-green" and "greenish-blue," according to whether green or blue was the strongest component. But probably there would be no necessity for this, as the number of tints (forty-eight in all) seems sufficient for



the required purpose, and is twice as many as the number on Smyth's chromatic diagram. Commencing, now, with the centre as "white" (see diagram), the symbol for which is "0": the first circle will represent ruddy white, creamy white, yellowish white, greenish white, bluish white, and purplish white, their symbols being R^1, Or^1, Y^1, G^1, B^1, and V^1: the next circle *pale* red, *pale* orange, *pale* yellow, &c.; symbols, R^2, Or^2, Y^2, &c.: the succeeding circle is intended to be equivalent to the *normal* shade of red, orange, yellow, &c.; symbols, R^3, Or^3, Y^3, &c.: the outer circle corresponds to the deepest shades of colour, as *very* red, *very* orange, *very* yellow, &c.; symbols, R^4, Or^4, Y^4, &c. Thus the four terms in each series

X

are supposed to be equal to four corresponding increments of depth of shade, the numerical ratios being *direct*, instead of *inverse*, as in Smyth's scale. And it is at once apparent how readily these terms admit of reduction in discussing a number of observations. I have not thought it necessary to specify the subordinate colours here, as their corresponding symbols appear on the diagram. But though they all follow the same invariable rule—that is, the *inner* circle means *white tinged* with the given colour: circle 2, a *pale* tint of the colour; circle 3, the *normal* colour; and circle 4, the *deepest* tint of colour, yet it will not, in all probability, be requisite to use the first term in their series, as six different tints of white are as many as can be well distinguished from each other.

P.S.—The original diagram, of which the annexed is a copy, was executed in water-colours, and gives a much better idea of the proposed scheme than one in black and white can possibly do, but it would probably be difficult and expensive to reproduce in a satisfactory manner.

On the Best Device for Revolving a Dome. By Professor David P. Todd.

(*Communicated by the Secretaries.*)

The various methods which have been devised for applying power to revolve a dome show that it is a matter of considerable importance in observatory construction. The number of these methods shows also that many of them, at least, are imperfect either in principle or construction. A very common method, especially in the older observatories, consists of a continuous rachet or cog-wheel run around the bed-plate or interior of the dome, in which a cog-wheel on a short journal runs, the power being communicated to this latter in the simplest manner. The difficulties in the way of this device consist rather in the imperfection of the running-gear of the dome itself. In constructing the large dome of the Washburn Observatory, at Madison, Wisconsin, the late Professor Watson sought to overcome these difficulties by a double cog-wheel, which should work into the rachet of the dome on exactly opposite sides of the latter. In order to secure this end, a somewhat cumbersome apparatus was devised and applied, consisting of two vertical shafts on opposite sides of the dome geared into a rigid horizontal shaft, running across from one side to the other, underneath the floor of the dome. This apparatus is described in Vol. I. of the publications of this Observatory. In constructing the smaller dome of the Lick Observatory, the idea occurred to Mr. Fraser, the superintendent of construction, that the dome itself might be considered as a large pulley, and a rope run around it as such, and brought into the inside of the dome, where it was carried around a suitable